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Air vent for a ventilation system

The invention relates to an air vent for a ventilation system in a vehicle.

With the known ventilation systems, the air emerges through outflow vents having air guide elements such as vanes or rotating cages that are usually adjustable and near the outlet surface. The appearance of the outlet surface is characterized by the position of the guide elements and is not uniform. A covering of the guide elements on the outlet surface with a grid or the like is not possible since the orienting effect would be lost with such a covering.

Air vents are also known that have a diffusing effect. With these, the outlet surface can have a uniform appearance, but no orienting effect is possible, so that outflow devices with a diffusing effect are installed in the vehicle in addition to those with an orienting effect when both modes of air distribution are to be provided.

DE 197 21 831 A1 describes an air outflow device for the interior of a vehicle, comprising an air outlet element that can be rotated around an axis and that is provided with passages. Depending on the position of the air outlet element, the air is fed into the passenger compartment in a diffused or in a directed manner. The outlet surface changes its appearance, depending on the position of this air outlet element.

DE 100 11 932 C1 discloses a device for feeding air into a passenger compartment, the device being provided with two air outflow openings. Here, one air

outflow opening serves for direct ventilation and the second for a diffuse air feeding.

The present invention provides an air vent that, irrespective of its setting, has a uniform appearance of the outlet surface and permits any mode of air distribution.

5 Specifically, the invention provides an air vent for a ventilation system in a vehicle, with an air circulation chamber which is defined by a housing that has a generally bulged shape. An inflow duct is connected to the housing of the circulation chamber and opens in it. The housing has a perforated wall area. In use an air stream enters the circulation chamber through the inflow duct, circulates through
10 the air circulation chamber and exits through the perforated wall area. The air vent further comprises a movable air deflection member that is disposed to deflect the air stream transversely to an axial direction of the inflow duct.

 The bulged circulation chamber and the arrangement of a movable air deflection member that deflects the air stream transversely to the axial direction of
15 the inflowing air stream cause a partial air flow to rotate inside the circulation chamber. Through the use of the movable air deflection member, the direction of rotation of the partial air flow in the circulation chamber can be varied as desired. As a result of the rotation, a speed component is formed that is parallel to the perforated wall area that forms an outlet surface. The emerging air is deflected
20 correspondingly. In other words, in certain areas of the bulged circulation chamber, the air flow passes along the inside wall and maintains its direction as it emerges from the circulation chamber. Even by a cover grid this direction is not influenced.

 In one embodiment, the air deflection member is located opposite the
25 perforated wall area at an end of the inflow duct and has a generally ball-shaped body. It is rotatably accommodated in an annular bearing set in the end of the inflow duct. The air deflection member defines a channel section of cylindrical shape that extends diametrically through the ball-shaped body.

With such an air deflection member, the inflowing air stream can be guided directly along the inside of the housing, causing a rotation of a partial air stream. The air deflection member being located opposite the perforated wall area, the air stream can be guided along the housing inner side in any direction.

5 In a preferred embodiment, an air guide is arranged in the air circulation chamber adjacent to the perforated wall area. With this air guide that is situated inside the circulation chamber, the deflection of the air flow already caused by the rotation effect can be further intensified. This air guide can be designed in such a way that it can simultaneously be used as a support plate for a fine-meshed cover
10 grid. The air guide can include a set of straight baffle members which are pivotally mounted in the air circulation chamber upstream of the perforated wall area. The setting of these baffle members can either support the directed air flow or rather diffuse the air stream.

15 In another embodiment, the air deflection member consists of a shield member. This shield member can be shifted in an axial direction inside the air circulation chamber. It is also possible to move the shield member into a shut-off position in which it closes the inflow duct. In this manner, a change in the direction of the outflowing air as well as a complete interruption of the air stream can be achieved with just one air deflection member, the shield member.

20 In a preferred embodiment, the shield member interacts with an annular diffuser structure. Here, the diffuser structure as well as the shield member are movable inside the air circulation chamber. Depending on the position of the shield member and the diffuser structure relative to each other, the same air vent can achieve a diffuse or a directed ventilation of the passenger compartment. In a
25 covered position, the shield member covers the diffuser structure. There, the diffuser structure has no influence on the deflection of the directed air flow by the shield member. The diffuser structure is only effective when it is placed near the perforated wall area of the circulation chamber, since only then air does flow through it.

In a preferred embodiment, the perforated wall area is formed by a fine-meshed grid. This arrangement gives the visible front of the air vent a uniform appearance.

Further features of the air vent according to the invention ensue from the claims and the following description with reference to the accompanying figures. These figures show the following:

- Figure 1 a section through an air vent according to the invention;
- Figure 2 a section through another embodiment of the air vent;
- Figure 3 a section through another embodiment of the air vent
10 according to the invention;
- Figure 4 an exploded view of another embodiment of an air vent
according to the invention;
- Figure 5 a section through an embodiment with a shield member that
can be moved transversely to the axial direction;
- 15 - Figure 6 a section through an air vent according to the invention with
a shield member that is mounted for pivotal movement;
- Figures 7 to 9 another embodiment of the air vent according to the invention
with the shield member and a diffuser structure in different positions.

Figure 1 shows a section of a circulation chamber 1 with a bulged shape with
20 its housing 9 and an inflow duct 2. A perforated wall area 3 is formed by a fine-meshed grid 8. Inflow duct 2 is connected to housing 9 and opens into circulation chamber 1 opposite to the perforated wall area 3. An air deflection member 4 has a generally ball-shaped body. It is rotatably accommodated in an annular bearing seat in the end of inflow duct 2. Air deflection member 4 defines a channel section
25 of cylindrical shape that extends diametrically through the ball-shaped body. To enter air circulation chamber 1, the air stream must pass this channel section. By

adjusting the rotary position of the ball-shaped body of air deflection member 4, the air stream is deflected. In the depicted position of movable air deflection member 4, the inflowing air, indicated by arrows 10, which enters, in use, through the inflow duct, runs to the left along the inner surface of housing 9. The air stream circulating through air circulation chamber 1 is thus deflected transversely to an axial direction of inflow duct 2 by the movable air deflection member 4. The air stream is then directed against the wall of housing 9 where it is deflected according to the curvature of the wall. A partial air stream extends along the wall of housing 9 while another partial air flow tends to circulate within the chamber 1. Due to the deflection, the air emerging through the perforated wall area 3 has a component in a direction opposite to that into which deflection member 4 is adjusted. An air guide 5 intensifies the formation of a speed component that is parallel to the perforated wall area. It is placed in air circulation chamber 1 adjacent to perforated wall area 3 and comprises a continuous wall that is spaced from the perforated wall area 3. This wall extends parallel to perforated wall area 3.

Figure 2 shows an embodiment that is slightly modified with respect to that of Figure 1. Air guide 5 includes here a set of curved baffle members 11 at fixed positions upstream of perforated wall area 3. A partial air flow inside circulation chamber 1 is imparted with a circular movement determined by the position of movable air deflection member 4. Compared to the embodiment of Figure 1, the air flow in Figure 2, indicated by arrows 10, is hindered to a lesser extent. Curved baffle members 11 are arranged in such a way that they intensify the deflection of the air emerging from air circulation chamber 1 and promote a partial rotating flow within the chamber 1.

In another embodiment, shown in Figure 3, air guide 5, which is arranged adjacent to perforated wall area 3 inside air circulation chamber 1, includes a set of straight baffle members 12 that are pivotally mounted in air circulation chamber 1 upstream of perforated wall area 3. With the positions of air deflection member 4 and straight baffle members 12 as shown in Figure 3, a diffuse air

outflow is generated. If a circulation of the air flow inside the circulation chamber 1 is achieved by directing the air deflection member 4 as shown in Figures 1 and 2, then this directed air outflow can once again be intensified by a suitable position of straight baffle members 12.

5 Figure 4 shows an exploded view of another embodiment with an air circulation chamber 1, a shield member 6, a diffuser structure 7, and a fine-meshed grid 8. Shield member 6 arranged inside air circulation chamber 1 serves to generate an air circulation inside the bulged circulation chamber 1. Shield member 6 has a convexly curved face. Here, the air flow is guided between shield
10 member 6 and housing 9 of air circulation chamber 1. The diffuser structure 7 arranged inside the circulation chamber can either be covered by shield member 6 or else it can be moved into the air flow so that a diffuse air outflow is made possible. The fine-meshed grid 8 serves to cover the air vent and provides a uniform appearance.

15 Figures 5 and 6 each show a section through an air vent corresponding to the exploded view of Figure 4, but without showing a diffuser structure. Air circulation chamber 1 with a bulged shape is surrounded by housing 9 with a generally spherical shape. Via inflow duct 2, air enters air circulation chamber 1. The convexly curved face of shield member 6 is exposed to the entering air
20 stream. The perforated wall area is formed by a fine-meshed grid 8. In Figure 5, shield member 6 which is circular in shape is mounted to be movable transversely to the axial direction. In the position shown, the air flow can only pass shield member 6 on the right-hand side and it comes to lie against the housing wall 9 of air circulation chamber 1. The air flow retains its direction, even after passing
25 through the grid 8.

As shown in Figure 6, shield member 6 may be mounted for pivotal movement about a pivotal axis that is perpendicular to the axial direction. Here, too, an air flow 10 passes between the inner wall of housing 9 of circulation chamber 1 and shield member 6. The air flow passes through the fine-meshed grid 8 and leaves
30 the air vent in a directed manner.

The mode of operation of diffuser structure 7 is explained with reference to Figures 7 and 8. Both figures show air circulation chamber 1 with an inflow duct 2, a shield member 6 and a diffuser structure 7. The annular diffuser structure 7 comprises an outer ring and a central deflection body that has a concave peripheral surface of revolution. In Figure 7, shield member 6 and diffuser structure 7 are immediately adjacent to each other. Thus, the shield member is in a covering position in which it covers the diffuser structure. The inflowing air 10 is deflected by shield member 6 and guided around the outside of diffuser structure 7. Diffuser structure 7 does not have any effect on the air flow. The perforated wall area, formed by a fine-meshed grid 8, bundles the air flow that escapes in a sharp air jet. The air flowing out of the air vent is directed axially. The fine-meshed grid 8 does not influence the direction of the air flow.

Diffuser structure 7 is movable in air circulation chamber 1 towards and away from the perforated wall area. In Figure 8, diffuser structure 7 is shifted in the direction of the perforated wall area. The end face of the central deflection body of diffuser structure 7 which is opposite to the perforated wall area is adapted to cover a central part of the perforated wall area and is here moved into contact with the fine-meshed grid 8. Shield member 6 no longer covers diffuser structure 7. The air 10 flowing past shield member 6 now flows through diffuser structure 7. The air outflow is diffuse.

In figure 9, shield member 6 and diffuser structure 7 are moved into a shut-off position. Shield member 6 is movable inside air circulation chamber 1 in an axial direction towards and away from an opening in housing 9 where inflow duct 2 is connected to the housing 9. Shield member 6 closes off inflow duct 2 so that no more air enters air circulation chamber 1. With this shut-off position, the air flow through the air vent according to the invention can be completely prevented.